

Southwest Region/Southwest Fisheries Science Center
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REGIONAL STRATEGIC PLAN NMFS Southwest Region

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I. Introduction

The National Marine Fisheries Service (NMFS), a part of the National Oceanic and Atmospheric Administration (NOAA), has five regions located throughout the United States. The NMFS Southwest Region assesses, manages, and promotes the conservation of living marine resources in U.S. waters encompassing more than 1.3 million square miles of the Pacific Ocean.

The Southwest Region consists of both management and research entities. Fisheries management, protected resources, and habitat conservation issues are addressed by the Southwest Regional Office located in Long Beach, California, and its field offices in Santa Rosa, Arcata, and Eureka, California, Honolulu, Hawaii, and Pago Pago, American Samoa. Scientific and technical support of these issues is provided to the Southwest Regional Office by the Southwest Fisheries Science Center located in La Jolla, California, and its laboratories in Santa Cruz/Tiburon and Pacific Grove, California, and Honolulu.

Ten living marine resource programs pertaining to specific fisheries, protected species, and conservation areas are administered by the Southwest Region. These programs are: large pelagics (highly migratory species), California salmon, coastal pelagic fisheries, west coast groundfish, Hawaiian monk seals, insular fisheries, Pacific sea turtles, eastern tropical Pacific dolphins, Pacific region marine mammals, and Antarctic marine living resources.

In addition, both the Southwest Regional Office and Southwest Fisheries Science Center actively pursue three cross-cutting programs supporting the 10 resource programs along habitat, recreational fisheries, and economic lines. These programs provide additional avenues for documenting, assessing, and analyzing the respective resource programs.

On November 17-19, 1997, senior management staff of the Southwest Regional Office and Southwest Fisheries Science Center participated in a strategic planning session to review and update strategic planning information originally formulated during previous planning meetings, the most recent in April 1996. Participants included the regional and deputy administrators, science center and deputy directors, laboratory directors, regional and science center division chiefs, staff knowledgeable about key regional activities, and the regional and science center planning officers.

Using the 10 living marine resource programs and three supporting programs for the region, the participants broke into assigned groups to review and update the goal

statements, regional objectives, and specific milestones for each. A spokesperson appointed for each group then reported the results at a general session meeting.

The specific goals, objectives, and milestones for each of these 13 programs are reported here. In addition, information on the stakeholders or constituency for each program is provided, along with major issues and related coastal or NMFS programs.

II. Living Marine Resource Programs

Program 1: Large Pelagics (Highly Migratory Species)

I. Background

Large pelagics are the “highly migratory” species, including tropical tunas (yellowfin, bigeye, and skipjack), albacore, billfishes, swordfish, certain sharks, and other large pelagic fishes, that range the high seas to varying degrees, frequently outside U.S. fisheries management jurisdiction. Most are caught commercially, but some, especially certain billfishes, support important recreational fisheries. None of these species are listed as overfished, but the status of several is either uncertain or unknown. Most Pacific pelagic stocks are at or are fast approaching maximum sustainable yield levels. Conservation and management of highly migratory species is the highest fisheries priority of the U.S. State Department, and NMFS is committed to supporting the department in the pursuit of international arrangements for conservation and management of these species throughout the Pacific.

Management of these fisheries to maintain long-term productivity is complicated by a number of important factors:

- The large number of highly migratory species involved ranging over international waters and the exclusive economic zones (EEZs) of many nations.
- The many nations involved with different and often competing interests, some as coastal states and others as distant-water fishing nations.
- The competing interests of many international and domestic fishing sectors.
- The lack of a coherent international framework for regulating fishing and conducting or coordinating research to ensure conservation of the stocks throughout their range.
- The lack of a single, coordinated management structure for U.S. Pacific pelagic fisheries, resulting in management of various species under several authorities and applied solely to U.S. interests, with little or no stock conservation effect.

- The potential for U.S. fishing interests in the Pacific to be placed at a disadvantage relative to other nations' fisheries because of management actions imposed on Atlantic highly migratory species.
- The potential for placing U.S. fishers at a disadvantage relative to foreign fishers due to unilateral restrictions to offset conservation concerns (bycatch, interactions with protected resources).

Superimposed on this complex problem is the existence of important gaps in fishery and biological data for Pacific-wide stocks at the international level, with much of the existing information of unknown quality and reliability. This unfortunately provides some parties with a rationale for inaction on management of these stocks. At present funding levels, the Southwest Regional Office and Southwest Fisheries Science Center are not in a position to fill these gaps nor develop necessary Pacific-wide data collection programs with others.

The Southwest Regional Administrator has the lead for NMFS in working with the State Department and the fishery management councils to pursue effective conservation and management of highly migratory species stocks. This assignment should increase the probability of consistent policy and actions regarding these stocks. However, the large number of complicating factors still makes it extremely difficult to achieve effective conservation of highly migratory species stocks throughout their range. Perhaps ironically, the United States wishes to lead the promotion of international management of highly migratory species fisheries, yet it does not have coordinated management of the fisheries within its control.

The importance of the highly migratory species stocks arises from a number of factors:

- The stocks support large U.S. fisheries valued at upwards of \$200 million per year ex-vessel and perhaps \$1 billion per year at the retail level.
- The stocks support large and valuable (although the net economic value has not been estimated) recreational and charter fisheries.
- The U.S. State Department accords highly migratory species top priority for international fisheries concern.
- There are protected species and bycatch concerns that could be exacerbated in the absence of U.S. management of its Pacific pelagic fisheries.
- The lack of management of the highly migratory species fisheries throughout the range of the stocks could put the sustained benefits from the fisheries at risk through overfishing.
- Lack of progress on international management of Pacific-wide stocks could result in loss of access to these valuable resources for U.S. distant-water fleets.

II. Major Stakeholders

Major stakeholders are U.S. fishery participants (longline, purse seine, troll, handline, driftnet; commercial, recreational, subsistence) and associated support industries, as well as exporters, importers, and restaurateurs. In addition to the industrial side are various government entities, including three fishery management councils (Western Pacific, North Pacific, Pacific), coastal states and U.S.-associated insular areas in the Pacific, other NMFS units (Offices of Sustainable Fisheries, Protected Resources, Science and Technology, and Enforcement, other regions and centers), and numerous federal agencies (State Department, U. S. Fish and Wildlife Service, U.S. Coast Guard). A wide range of international organizations also are involved, including the Inter-American Tropical Tuna Commission (IATTC), the Interim Scientific Committee for North Pacific Tuna and Tuna-like Species, the Forum Fisheries Agency, the South Pacific Commission, and the U.N. Food and Agriculture Organization, as well as other nations (coastal states and distant-water fishing nations). Because of the environmental protection and conservation issues, a number of non-governmental organizations, including the Marine Mammal Commission, the World Wildlife Fund, the Natural Resources Defense Council, and the Audubon Society, as well as academia, also hold a major interest.

III. Major Issues

The primary issue facing NMFS for managing Pacific highly migratory species is the difficulty in developing a coherent NMFS strategy for addressing three closely related problems: (1) the distribution of authority to manage domestic highly migratory species fisheries among three councils under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) and the Southwest Region under the High Seas Fishing Compliance Act and international treaties or arrangements; (2) the emergence of international arrangements for setting total allowable catches, target and limit reference points, and allocations that could disadvantage U.S. fleets which have been limited under domestic law (for example, longliners) before establishing a good record of interest in continued harvests; and (3) the existence of a number of international organizations which so far lack institutional structures or procedures for coordination on issues dealing with the most widely ranging stocks.

There are many components to these central issues:

- Three fishery management councils have a stake in Pacific pelagic fisheries but only one fishery management plan (FMP) exists, and no single FMP can have significant stock conservation effects.

- The United States is both a coastal state and a distant-water fishing nation, but the interests of fleets in these different categories are not identical and may be affected differently by the manner in which total allowable catch and allocations are set.
- The U.S. fisheries for Pacific highly migratory species operate in various areas, target several species, and use assorted fishing gear; these varying interests make it difficult for the U.S. fishing industries involved to speak with a united voice or philosophy.
- A common set of rules for all fisheries for all gear types is needed so that none are competitively disadvantaged; however, not all nations share the same values regarding such issues as bycatch, conservation of protected species, and competition.
- Not all fleets using the same gear are subject to similar rules concerning such requirements as reporting, vessel monitoring systems, observers, and gear limitations.
- International organizations and arrangements have yet to establish consistent standards and protocols for the collection, management, and sharing of data on Pacific pelagic fisheries; data quality and comparability, crucial for good stock assessments and reliable determinations of long-term yield potentials, is questioned.
- There is no overall international commitment to collaborate in research and stock assessments throughout the range of the stocks involved.
- Any special allocations made to developing island states could be disproportionately taken from a single gear type or national fleet, with possible adverse effects on U.S. interests.
- Changing U.S. values, as expressed in its fishery laws, may impair our ability to find compatibility with international interests or other nations with differing values.

IV. Regional Strategic Goals

The Southwest Region's goals are to: (1) establish and enhance the scientific capabilities and management foundation for maintaining or increasing U.S. benefits from Pacific highly migratory species fisheries consistent with requirements under domestic laws (MSFCMA, High Seas Fishing Compliance Act) and international agreements (South Pacific Tuna Treaty, U.N. Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks, Panama Agreement, Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Species in the Western and Central Pacific) by 2001; and (2) establish a scientifically based, coordinated international and domestic fishery management system that maintains or enhances the U.S. long-term benefits from Pacific highly migratory species by 2001.

V. Regional Objectives

The following objectives have been identified to achieve the regional strategic goals:

A. *Achieve international management of highly migratory species:* Develop and implement international conservation and management strategies for Pacific highly migratory species stocks throughout their range (with the State Department).

B. *Manage domestic fisheries for highly migratory species via the fishery management councils:* Support the fishery management councils to meet all FMP requirements. Achieve coordinated management of U.S. fisheries for highly migratory species.

C. *Provide scientific advice for highly migratory species management:* Collect, analyze, and disseminate fishery data, conduct bycatch and protected species monitoring programs, and conduct the socio-economic, biological, and oceanographic research needed to understand the impacts of fisheries and management options.

VI. Major Milestones

A. *Achieve international management of highly migratory species:*

1. Participate in the Interim Scientific Committee for North Pacific Tuna and Tuna-Like Species and the Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Species in the Western and Central Pacific to achieve international collaboration in stock assessment and (eventually) agreements for fishery management.
2. Protect and enhance interests of U.S.-associated insular areas under international arrangements.
3. Establish mechanisms to ensure adequate communication and coordination among NMFS headquarters, the State Department, the NMFS regions and science centers, the fishery management councils, and constituents.
4. Carry out obligations under the South Pacific Tuna Treaty regarding industry reporting and licensing, placement of observers, sampling of landings, and assistance in stock assessment.
5. Carry out obligations under the new eastern tropical Pacific arrangement for dolphin conservation and tuna fishery management, including the establishment of a tuna tracking system.
6. Maintain a tracking system for Atlantic and Pacific bluefin tuna.
7. Meet all High Seas Fishing Compliance Act responsibilities.

8. Support the development of fishery enforcement capabilities, especially among Pacific island nations (for example, maintain NMFS enforcement liaison with the Forum Fisheries Agency in Honiara, Solomon Islands), and promote the fair and impartial deployment of vessel monitoring systems among all fleets using the same gear.

B. Manage domestic fisheries for highly migratory species via the fishery management councils:

1. Reach agreement with the Western Pacific Regional Fishery Management Council (WPRFMC), the Pacific Fishery Management Council (PFMC), and the North Pacific Fishery Management Council (NPFMC) on a structure and process for collaboration on domestic highly migratory species fisheries management under the MSFCMA.
2. Assure that WPRFMC, PFMC, and NPFMC fishery regulations and reporting and monitoring requirements apply fairly and uniformly to Hawaii-, west coast-, and Alaska-based longliners.
3. Help provide rigorous scientific analysis to support development and evaluation of FMP amendments and regulatory actions.
4. Provide NMFS input to the WPRFMC's annual report on fisheries under the western Pacific pelagics FMP.
5. Assist the WPRFMC in completing amendments of FMPs to meet new MSFCMA requirements.
6. Participate in WPRFMC and U.S. Fish and Wildlife Service (USFWS) initiatives to reduce seabird interactions and mortality in the longline fishery.

C. Provide scientific advice for highly migratory species management:

1. Maintain a Pacific-wide highly migratory species database for U.S. fisheries.
2. Conduct research on tunas, billfishes, and sharks to determine stock structure, interactions between species, aspects of gear vulnerability, spawning and foraging distributions, and habitats and their relationship to oceanographic conditions.
3. Assess interactions with protected species (seabirds, turtles, mammals) and develop and implement measures to mitigate, prevent, or reduce mortality (for example, complete an annual report required under biological opinion presenting estimated take and mortality of sea turtles in the Hawaii-based longline fishery and recommended changes (if any) in allowable takes and mitigation measures).

4. Assess bycatch and waste, conduct research into ways to reduce bycatch or mortality, and implement measures to reduce bycatch or reduce mortality from unavoidable bycatch.
5. Complete an assessment of impacts and implications of shark finning in the Hawaii-based longline fishery and resolve “controversy” over the finning issue.
6. Complete priority stock assessments and other research responsibilities resulting from international collaboration in scientific and fishery monitoring-related meetings (for example, the Interim Scientific Committee for North Pacific Tuna and Tuna-Like Species, Western Pacific Yellowfin Tuna Research Group, South Pacific Albacore Research Group).
7. Assure high quality in NMFS scientific research by publishing results in peer-reviewed scientific journals.
8. Provide industry and trade negotiators with accurate and timely information on Asian markets to increase access to those markets and increase the value of highly migratory species exports to those markets.
9. Complete an annual Honolulu Laboratory report on the Hawaii-based longline fishery.
10. Place longline observers consistent with a sampling frame to collect sea turtle and seabird interaction information and to collect biological data and samples in accordance with sampling protocols.
11. Administer a contract to place driftnet fishery observers in California and Oregon in accordance with a sampling design to collect data on protected species interactions and to collect biological data and samples.
12. Evaluate and apply archival tags, satellite remote sensing, and ocean circulation models to advance knowledge of the population dynamics of large pelagics and associated ecosystem components such as sea turtles.
13. Incorporate appropriate large pelagic recreational fisheries data into the Recreational Fishery Information Network (RecFIN) database.
14. Implement a mechanism for timely distribution of highly migratory species program information to the public.

VII. Related Coastal or NMFS Programs

Related programs include protected resources (sea turtles, marine mammals) and habitat conservation (essential fish habitat).

Program 2: California Salmon and Steelhead

I. Background

Of the five species of Pacific salmon, only chinook and coho are of concern in California. These two species support traditional and important commercial and recreational fisheries in California and Oregon.

The Klamath and Sacramento Rivers are major producers of chinook salmon in California. Chinook salmon stocks are named for the season in which they migrate to freshwater to spawn; these include the spring, fall, late fall, and winter runs. At present, hatchery production is highly responsible for sustaining these fisheries. California coho salmon or “silvers” spawn in small coastal streams and rivers. Hatchery production of coho salmon also is extensive.

Chinook salmon populations tend to fluctuate considerably depending on freshwater habitat conditions and ocean productivity. In recent years, environmental conditions were generally unfavorable and resulted in historically low levels of chinook stocks and commercial and recreational catches. The winter run of chinook salmon in the Sacramento River is listed as endangered under the Endangered Species Act (ESA). Several other runs from all parts of the coast failed to meet escapement goals in recent years. Concern for the status of depressed stocks has led to increasingly restrictive ocean fishing seasons for chinook salmon.

Many user groups compete to catch salmon, even though strict limitations are required to protect the stocks. Thus, salmon management issues concentrate on catch allocations, protection of spawning stocks, and protection of juvenile salmon during their outbound migration. Management is complex, involving many stocks that originate from various rivers. Ocean fisheries for chinook and coho salmon are managed under an FMP by the PFMC with the cooperation of the State of California and tribal fishery agencies.

In addition to the difficulties with salmon, the numbers of steelhead rainbow trout, a species once abundant in California’s coastal streams and Central Valley rivers and streams, are declining.

II. Major Stakeholders

Major stakeholders include the PFMC and the commercial and recreational fishermen affected by council activities. Also involved are the numerous federal agencies that participate in activities that directly or indirectly affect efforts to conserve and rebuild salmon and steelhead stocks. These include the USFWS, U.S. Forest Service, Natural Resources Conservation Service, Environmental Protection Agency (EPA), U.S. Army Corps of Engineers, Bureau of Reclamation, Bureau of Indian Affairs, and Bureau of Land Management. Numerous state, county, local, and private agencies are also stakeholders, including various agencies within the California Resources Agency, the

California EPA, water agencies, resource conservation districts, and also tribal governments. Several industrial interests are involved in salmonid issues, including the timber, agriculture, and mining industries. Non-governmental organizations such as the Sierra Club, United Anglers, Pacific Coast Federation of Fishermen's Associations, Salmon Restoration Federation, Trout Unlimited, and CalTrout are also involved, as is academia. The Southwest Region's salmon program also serves several stakeholders within NOAA, including Sea Grant, other NMFS units (Offices of Sustainable Fisheries and Protected Resources, Northwest Region, Enforcement), General Counsel, the National Ocean Service's Damage Assessment and Restoration Program, and the National Marine Sanctuaries program.

III. Major Issues

The decline in chinook and coho salmon abundance has forced severe reductions and closures of ocean fisheries and freshwater recreational fisheries as well. With the prospect of even further restrictions, actions to recover and restore winter-run chinook and Central Valley and coastal salmonids are underway while attempting to sustain existing fisheries.

The Southwest Region is actively engaged with the Department of the Interior, the EPA, and the State of California (among others) in implementing the Central Valley Project Improvement Act. One of the major objectives of this act is to double the anadromous fisheries populations in the Central Valley by 2002.

Using hatcheries to mitigate habitat losses and to enhance fisheries has raised concerns about the interactions of hatchery fish and natural or wild stocks. While hatchery fish can supplement natural production, they can also compete with naturally produced fish. In addition, hatchery fish are often of non-native origin, and the introgression of non-native genes into natural fish populations can compromise the genetic integrity of the native stocks and perhaps decrease their viability.

Efforts to manage steelhead and reverse their population decline have been hampered by a lack of biological information. Markedly lacking is information on steelhead populations, particularly population status and basic life history of individual stocks.

Because salmon and steelhead depend on freshwater habitat for spawning and juvenile development, they are particularly vulnerable to habitat degradation caused by human activities. Throughout their range, habitat has been degraded by logging, agriculture, grazing, mining, and urbanization. Water development for hydropower, irrigation, and municipal and domestic uses directly competes with salmon for fresh

water. Reducing these impacts is key to reversing the population decline of natural populations of chinook, coho, and steelhead.

Increased workloads resulting from the growing number of salmon ESA listings have severely hampered the ability of staff at the Southwest Region's Santa Rosa office to adequately address all salmon issues brought to their attention. Many of these issues cannot be fully addressed and others cannot be addressed at all. In addition, the impending task of conducting essential fish habitat consultations on chinook and coho species once amended FMPs have been approved by the Secretary of Commerce may place an additional strain on the overburdened staff. Because of the clear need to prioritize issues as a way of effectively assigning staff time to the increased workloads, the Santa Rosa office will need to formulate a long-range strategy. The need for additional manpower is clear.

IV. Regional Strategic Goals

The Southwest Region's goals are to: (1) reverse the decline of natural populations of chinook, coho, and steelhead in California by 2002; and (2) rebuild economically viable and sustainable fisheries.

V. Regional Objectives

The following objectives have been identified to achieve the regional strategic goals:

A. *Research*: Provide short- and long-term applied research on all aspects of salmonid life history in both coastal and freshwater ecosystems to support management objectives of sustainable fisheries, restored habitats, and recovered species.

B. *Restore, conserve, and enhance habitat*: Use the best biological and engineering science to restore, conserve, and enhance coastal and freshwater ecosystems through consultation and coordination with federal, state, and local governments.

C. *Recover protected species*: Use and initiate management, enforcement, and research programs to recover natural populations of protected salmon species in coastal and freshwater ecosystems through ESA authorities and programs in coordination with federal, state, and local governments.

D. *Sustain commercial fisheries*: Develop and coordinate management and research activities to recover California salmon to sustainable fishing levels.

E. *Sustain recreational fisheries*: Develop and coordinate management and research activities to recover California salmon to sustainable fishing levels.

VI. Major Milestones

A. Research:

1. Develop and improve escapement estimation to accurately monitor winter-run populations and recovery.
2. Develop a winter-run life cycle model.
3. Increase port sampling effort to recover coded-wire tags for stock identification.
4. Assess fish contaminant problems in the Sacramento Bay and Delta system.
5. Continue life cycle models (coho, chinook, steelhead) in coastal watersheds.
6. Assess population status for coho, steelhead, and chinook through partnerships.
7. Increase field sampling and genetic stock identification to identify times and areas when listed populations are most vulnerable to fisheries.
8. Improve run size forecasting for Central Valley and Klamath chinook and develop in-season forecast adjustments.

B. Restore, conserve, and enhance habitat:

1. Screen five major water diversions in the Sacramento River.
2. Determine the feasibility of restoring Battle Creek for winter-run habitat (disease, water temperature and quantity, fish passage).
3. Develop geographic information systems expertise and systems within the Southwest Region and Southwest Center by 1998.
4. Continue a cooperative NMFS/USFWS agreement to implement Central Valley Project Improvement Act fish screening programs.
5. Provide technical engineering assistance to federal, state, and local agencies and landowners to screen small water diversions.
6. Continue partnership with the Natural Resources Conservation Service and provide fish screen expertise to private landowners.
7. Provide technical assistance to support grass-roots watershed restoration efforts.
8. Coordinate with the Natural Resources Conservation Service in administering disaster relief funds.

C. Recover protected species:

1. Assist the NMFS Northwest Region in a final recovery plan for winter-run chinook, coho, and steelhead.
2. Resolve genetics problems in the Coleman fish hatchery.
3. Develop habitat conservation plans (for example, Sierra Pacific Industries).
4. Issue a Section 10 permit for the striped bass program.
5. Monitor commercial and recreational fisheries and reduce incidental take of winter-run.
6. Implement the Bay-Delta accord to guarantee acceptable habitat conditions.
7. Assess redd distribution in real time for water management decisions.
8. Promote state/federal hatchery reform (production levels, genetics, impact of stray fish on natural populations, mass markings, trucking).
9. Provide leadership and support to the California Watershed Protection and Restoration Council.
10. Continue to implement President's Forest Plan/PACFISH to protect and restore salmonid habitat on federal lands.

D. Sustain commercial fisheries:

1. Enforce regulations to protect winter-run chinook in river and conduct a winter-run outreach program (regulations, habitat, reduce post-hooking mortality).
2. Coordinate annual fishing regulations.
3. Assess impacts and develop and implement methods to deter sea lion and marine mammal interactions with fishermen.
4. Assure continued availability of Klamath River escapement data and port sampling currently funded by the Anadromous Fisheries Act and the State of California.
5. Increase enforcement and surveillance of fishermen to reduce poaching and improve compliance with minimum size limits.

E. Sustain recreational fisheries:

1. Develop and publicize fishing gears and handling techniques that improve survival of hooked and released salmon.
2. Assess hooking mortality from angling.

VII. Related Coastal or NMFS Programs

Related programs include habitat conservation (essential fish habitat), the NMFS National Habitat Plan, the NMFS Recreational Fishery Resources Conservation Plan, and the NMFS Restoration Center.

Program 3: Coastal Pelagic Fisheries

I. Background

Coastal pelagic species support one of the largest fisheries along the west coast and are important sources of food, bait, and industrial fishery products. The major stocks are northern anchovy, Pacific sardine, jack and Pacific (chub) mackerels, and market squid. Coastal pelagics are primarily concentrated and harvested off California and Baja California, but smaller fisheries with growth potential exist in Oregon, Washington, and British Columbia.

Currently, the northern anchovy fishery is managed under the northern anchovy FMP, Pacific sardine and chub mackerel are managed by the State of California, and the

jack mackerel fishery north of latitude 39°N is managed under the Pacific coast groundfish FMP.

The PFMF, on a motion from the State of California, has decided to amend the northern anchovy FMP to comply with requirements of the new MSFCMA and to expand the scope of the plan to cover all major coastal pelagic stocks, including anchovy, sardine, both mackerels, and market squid. An important goal of the new FMP will be to make best use of existing state and federal resources for monitoring, assessment, and management of coastal pelagic species.

The “central subpopulation” of the northern anchovy provides most of the U.S. anchovy catch. Its biomass peaked at 1.6 million metric tons in 1985, declined to 145,000 metric tons by 1992, increased to 392,000 metric tons in 1994, and is thought to have increased further during 1995–97.

Pacific sardine numbers off California, Oregon, and Washington are increasing. Since 1986, stock biomass has increased about 40% per year; the current biomass is about 500,000 metric tons. Commercial demand for sardines is strong, and as catch quotas grow the fishery is expected to thrive.

Pacific mackerel supports one of California's more important fisheries and has been the mainstay of the purse-seine fleet in recent years. The fishery started in the late 1920s and has fluctuated repeatedly over the years, with abundance now thought to be declining. The resource is now harvested by three separate fisheries: a California commercial fishery, a sport fishery, and a Mexican commercial fishery.

Jack mackerel is utilized by the fishery in about the same manner as Pacific mackerel but is harder to catch, is less valuable, and is delivered in smaller quantities. Recently, there has been some interest in developing an offshore fishery for this underutilized resource. The availability of jack mackerel is very erratic. Assessment and management are difficult because of limited data and the stock's broad distribution.

In 1996, California market squid was the largest and most valuable fishery in the state, with landings of about 80,000 metric tons worth about \$33 million. The size and value of the fishery increased in recent years as markets developed in Asia. No information about current biomass or trends in biomass is available.

II. Major Stakeholders

Fishermen and processors who work in the coastal pelagic species fishery and account for 60% of the total California catch (all species) are major stakeholders. Most of these interests are based in California, but in recent years boats from Oregon, Washington, and Alaska have entered the market squid fishery. Recreational fishers are stakeholders because coastal pelagic species, particularly northern anchovy and sardine, are important as live and dead bait in recreational sport fish, groundfish, and salmon fisheries. Constituents concerned with the environment are stakeholders because northern anchovy, sardine, and squid are the major forage for many species of large fishes, marine mammals, and birds. Species dependent on coastal pelagic species include several threatened and endangered species.

III. Major Issues

Mackerel, sardine, and northern anchovy are transboundary stocks exploited by U.S., Mexican, and (to a limited degree) Canadian fleets, but no multinational management agreement has been reached for coordinated management of the stocks. Harvest levels are increasing in Mexican waters, and the absence of a governing bilateral agreement is compromising management of the same stocks fished by both the United States and Mexico.

Jack mackerel is underutilized, while the Pacific sardine is increasing in abundance after decades at low levels. These species may support an increased harvest by U.S. fishermen in the near future.

The sardine stock is growing beyond our ability to monitor it. Its geographic range has increased with abundance and is now larger than the area covered by the fishery or surveys. Results from a coast-wide egg pump survey conducted during the spring of 1998, in conjunction with an NMFS hydro-acoustic survey for Pacific whiting, will provide key information about sardine abundance.

Pacific mackerel, an important species in the fishery until recently, has become difficult to monitor as biomass has decreased, because the stock is distributed outside the area covered by the fishery and surveys.

The fisheries biology and population dynamics of market squid are poorly known. The stock may or may not be able to sustain recent high catch levels. Squid are believed to live for only one year and annual recruitment may be highly variable, even in the absence of fishing. Benefits of potential management measures are unknown.

NMFS scientists work closely with state biologists and the PFMC in maintaining and managing Pacific coastal pelagic stocks. Stock assessment models have been developed for northern anchovy, Pacific sardine, and Pacific mackerel. While the new models are more reliable and precise than earlier models to estimate biomass for these stocks, they also utilize more data, including fish spotter data from pilots employed by commercial fishermen and California Cooperative Oceanic Fisheries Investigation (CalCOFI) ichthyoplankton data. Collaborative surveys, exemplified by the 1994 daily egg production method spawning biomass survey carried out by NMFS, the State of California, and the Mexican Department of Fisheries, supply important information on the distribution of coastal pelagic stocks.

IV. Regional Strategic Goals

The Southwest Region's goals are to: (1) amend the northern anchovy FMP to include all coastal pelagic species by 1999; (2) develop survey approaches to track coast-wide abundance of sardine and other widely distributed pelagic stocks; and (3) obtain fundamental fisheries biology information for market squid and evaluate potential management measures.

V. Regional Objectives

The following objectives have been identified to achieve the regional strategic goals. All objectives depend on collaborative work with state scientists and fishery managers.

A. *Pacific sardine and Pacific mackerel*: Refine survey approaches and assessment models for Pacific sardine and Pacific mackerel to include the entire geographic range of the stocks, including regions outside the current data collection area and fishery.

B. *Market squid*: Determine longevity and reproductive biology of market squid by 1999. Evaluate potential management measures (including time and area closures) for market squid by 2000.

C. *Scientific and technical leadership*: Provide scientific and technical leadership at the federal, state, and international levels for coastal pelagic species.

VI. Major Milestones

A. Pacific sardine and Pacific mackerel:

1. Complete the coastal pelagic species FMP by September 1998.
2. Sustain and expand monitoring of the California Current through cooperative cost-sharing programs with the University of California and the California Department of Fish and Game and annually produce a status of the environment and stocks report.
3. On an experimental basis, expand the geographic extent of CalCOFI surveys to include areas between Pt. Conception and Monterey, California.
4. Develop and refine survey methods for monitoring sardine and mackerel throughout their range.
5. In collaboration with the NMFS Alaska Fisheries Science Center, carry out a coast-wide egg pump survey for sardine.

B. Market squid:

1. Estimate longevity based on statolith daily ring counts.
2. Describe reproductive biology with particular attention to number of spawning bouts and lifetime fecundity.
3. Characterize and map spawning habitat.

C. Scientific and technical leadership:

1. Maintain active links to California, Mexico, and other countries with coastal pelagic fisheries through CalSAFE, MEXUS-Pacífico, the Pacific International Council for Exploration of the Sea, the Global Ocean Ecosystems Dynamics Program, and the Inter-American Institute.
2. Carry out a collaborative squid research program with state biologists. Help revise and prioritize research plans.

VII. Related Coastal or NMFS Programs

Related programs include protected resources (marine mammals and salmon), habitat conservation (essential fish habitat), and recreational fisheries.

Program 4: West Coast Groundfish

I. Background

The Pacific coast groundfish fishery includes 83 species managed by the PFM off Washington, Oregon, and California. These groundfish are harvested commercially by trawl, trap, and hook-and-line gear. A recreational fishery also operates from shore, private boats, and charter or commercial passenger fishing vessels.

Most major west coast groundfishes are now fully harvested, and recent catches have been controlled by annual quotas and trip limits. Many groundfish species can live a long time (50+ years if unfished) and can support only low harvest rates. Several fish assemblages contribute to the fishery. Some of the major fisheries are described below.

The midwater trawl fishery for Pacific whiting dominates the harvest tonnage for groundfish species and contributes the greatest value. Pacific whiting are well studied, but additional work is needed to improve three- to five-year forecasts. The greatest management problems for this species are allocation between onshore and offshore fisheries, bycatch of salmon, and allocation of catch between the United States and Canada.

A deepwater trawl fishery exists for sablefish. The size and age composition of the commercial landings has been monitored only since 1986, and the magnitude of current and historical discarded catch is not well known. Pot surveys, which have been discontinued, and trawl surveys, which have been criticized by industry and outside scientific review, indicate a declining stock. Imprecise age and survey data have resulted in considerable uncertainty as to the true state of the resource. The most recent stock assessment incorporated a preliminary analysis of catch per unit effort (CPUE) as revealed in trawl logbooks as ancillary information to determine the trend in stock abundance. Further work with logbook data is expected, as is a new slope survey next year using industry vessels which are allowed to sell their catch to cover costs.

A deepwater trawl fishery also exists for Dover sole. Stock assessments for this species suffer from the same lack of extensive, reliable survey data. Although fishery landings and fishing effort data have been collected for several years, interpretation has been confounded by changing market conditions impacting the fishery and the fact that discards are not monitored.

Thornyheads are harvested in deepwater trawls along with sablefish and Dover sole. Their landings nearly tripled from 1987 to 1990, owing to increased market demand. Data for a reliable stock assessment will be difficult to obtain, but because shortspine

thornyhead are extremely long-lived, their harvest rate must remain lower than sablefish and Dover sole.

A trawl and hook-and-line fishery for the numerous rockfish species exists. Rockfish are hard to assess because of their low mortality rates and high variability in trawl surveys. The age composition of the six major rockfish species caught has been well monitored and used in catch-at-age analyses, but better survey methods must be developed for more accurate stock assessments. Comparable assessments of the 49+ lesser rockfish species are not possible because of the lack of fishery and survey data.

II. Major Stakeholders

Stakeholders include the PFMFC, the states of California, Oregon, and Washington, the Pacific States Marine Fisheries Commission, and the coastal communities lining the coast from California to Washington. Industrial stakeholders include fish processors and the groundfish fleets (especially those based in California), including trawlers, limited entry hook and line, open access hook and line, limited entry fish pot, open access fish pot, and open access set net. Other stakeholders include commercial providers of recreational angling (commercial passenger fishing vessels), recreational anglers, public interest groups, and consumers.

III. Major Issues

Management of the west coast groundfish fisheries involves old and new allocation issues. Accurate, long-term predictions of potential yield to assist in allocation decisions and setting acceptable biological catch limits will require a substantial increase in the Southwest Region's knowledge about competitive and predatory interactions in the biological system that includes groundfish, and about ocean climate effects on this community. The target exploitation rate for most groundfish species is designed to achieve a large fraction of maximum potential yield on a sustained basis while reducing the abundance of spawners by about two-thirds. The appropriateness of this target depends on the degree of natural fluctuation of recruitment and the extent to which the reduction in spawning biomass reduces mean recruitment levels. Only decades of monitoring the stock's performance will ascertain whether or not recruitment variability and average level justifies this target.

Models of long-term potential yield depend on assumptions of constant average environmental conditions or an ability to predict changing conditions. Better understanding of potential linkages between fish recruitment and long-term changes in the ocean climate are key to improved five- to ten-year forecasts of fishery potential yield.

However, these forecasts of fishery yield depend on presently uncertain forecasts of long-term ocean climate changes, as well as the linkages between climate and recruitment.

Data collection to improve stock assessments is needed. It is prudent, however, to assume that the assessments will be subject to considerable uncertainty for the foreseeable future. It is necessary to search for management measures and approaches which are robust with respect to the uncertainties identified in the assessment models, and to present the risks inherent in alternative policies in ways which are intelligible to fishery managers and other stakeholders.

IV. Regional Strategic Goals

The Southwest Region's goals are to: (1) provide the PFMC, the states, and industry with leadership in groundfish science and management to prevent overfishing; and (2) maintain economic benefits from fisheries (including recreation) in California at 10% above the level that would be attained without this leadership.

V. Regional Objectives

The following objectives have been identified to achieve the regional strategic goals:

A. *Stock assessments*: Improve data collection efforts by states cooperatively to increase reliability of stock assessments.

B. *Unreported landings*: Obtain knowledge regarding the extent of non-reporting of groundfish landings.

C. *Alternative management strategies*: Develop and evaluate alternative management strategies for groundfish (for example, harvest refugia, capacity reduction programs).

D. *Data precision*: Increase the precision of ichthyoplankton, juvenile, and adult groundfish data and surveys used by managers with reduced costs by using new high-tech sampling strategies (for example, adaptive sampling).

E. *ITQ management*: Understand the effects of individual transferable quota (ITQ) management on the economics of the groundfish fishery. Make such understanding available for use in any application of ITQ management should the present moratorium on ITQs be lifted.

VI. Major Milestones

A. *Stock assessments:*

1. Review the adequacy of Pacific Fishery Information Network and RecFIN funding and develop a mechanism to provide a stable funding base.
2. Complete at least one groundfish stock assessment annually (including integrating new techniques for predicting rockfish first year success into the assessment procedure).
3. Include three-year forecasts of abundance for widow and chilipepper rockfish in their next assessments.
4. Bring the CalCOFI time series for groundfish up to date for potential use in groundfish stock assessments by 1999.
5. Extend the CalCOFI egg and larvae survey north to Pt. Arena, California.
6. Bring biological sampling in southern and central California up to the sampling level of the rest of the state.

B. *Unreported landings:*

1. Learn the extent of non-reported groundfish landings and use the information to evaluate adequacy of the enforcement and monitoring system.

C. *Alternative management strategies:*

1. Develop management alternatives which are robust with respect to information gaps on stock dynamics and stock condition.
2. Publish an economic description of the California rockfish fishery by 2000.
3. Complete a series of economic projects related to capacity reduction in the groundfish fishery by 2000.

D. *Data precision:*

1. Publish molecular genetic criteria for identifying rockfish by 2000.
2. Publish a feasibility study for using adaptive sampling to increase precision and reduce costs of groundfish data and surveys by 2000.
3. Identify cryptic rockfish species in ichthyoplankton and commercial fish products using molecular genetic techniques.
4. Develop aging technology to improve precision of catch-at-age estimates of rockfish catch by 100%.

E. *ITQ management:*

1. Publish a formal mathematical description of ITQ systems and models to understand their management effects on the economics of the fishery (should the present moratorium on ITQs be lifted).

VII. Related Coastal or NMFS Programs

Related programs include habitat conservation (essential fish habitat), protected resources (pinnipeds, salmon), core statistics, the NMFS Recreational Fishery Resources Conservation Plan, and the National Marine Sanctuaries program.

Program 5: Hawaiian Monk Seals

I. Background

Abundance of Hawaiian monk seals declined by about 50% between the late 1950s and the late 1970s, and in 1976 the species was designated as depleted under the Marine Mammal Protection Act (MMPA) and listed as endangered under the ESA. The population continued to decline through the late 1980s and early 1990s, mostly due to a decline in the sub-population at French Frigate Shoals. Recent stabilization of population growth has been facilitated by mitigation efforts designed to enhance survival of females and by natural recruitment. The best estimate of current abundance is between 1,200 and 1,400 individuals.

Hawaiian monk seals are distributed throughout the Northwestern Hawaiian Islands (NWHI) in six main reproductive sub-populations at French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Reef, Midway atoll, and Kure atoll. Small sub-populations at Necker and Nihoa Islands are thought to be maintained by immigration from other islands and atolls. A limited number of Hawaiian monk seals also occur throughout the main Hawaiian Islands.

The various sub-populations have had different trends in abundance. For example, at French Frigate Shoals abundance grew rapidly from the 1960s to the 1980s, while other sub-populations declined rapidly. The current differences among the sub-populations probably reflects a combination of different factors.

Human activities have been associated with two major declines in the Hawaiian monk seal population. Limited information on the status of the population has indicated that this species was severely depleted by sealers, fishermen, and shipwrecked sailors during the 1800s. The most recent decline began in 1958 (no previous census data; decline may have started earlier), and by the late 1980s sub-populations at Laysan and

Lisianski Islands, Kure atoll, Midway atoll, and Pearl and Hermes Reef had decreased by 80-100%. These declines were probably due to poor recruitment resulting from disturbance associated with U.S. military and U.S. Coast Guard activities which disrupted the mother/pup bond and reduced juvenile survival.

Potential interactions between Hawaiian monk seals and human activities include various commercial fishing activities, recreational fishing, and human disturbance at haulout areas and sites of reproductive importance. However, the possible occurrence of these interactions has been poorly documented. Additionally, environmental factors such as decadal fluctuations in oceanic productivity appear to have indirectly influenced population growth through changes in the availability of prey resources.

II. Major Stakeholders

The State of Hawaii, commercial (lobster, bottomfish, longline) and recreational fisheries, Phoenix Air Inc. (a private contractor at Midway atoll), federal agencies (USFWS, U.S. Navy, U. S. Army Corps of Engineers), the WPRFMC, marine mammal special interest groups, the Hawaiian Monk Seal Recovery Team, and the Marine Mammal Commission are all stakeholders.

III. Major Issues

Although disturbance from human activities on land has declined since the 1970s, impacts from fishing activities may be impeding recovery of the Hawaiian monk seal. Development and expansion of international fisheries in the North Pacific and domestic fisheries in the NWHI may involve interactions that are potentially detrimental to monk seals. These interactions may be lumped into four categories: (1) entanglement in fisheries debris from international fisheries (as well as marine debris from other sources) in the North Pacific, which appears to be a serious detriment to seals; (2) seal consumption of potentially toxic fishery discards; (3) competition for prey; and (4) direct conflicts by fishing operations in the NWHI, which may be of much lesser importance. Additionally, the recent development of ecotourism at Midway atoll should be monitored to ensure there are no adverse impacts to monk seals. Other potential human-related issues include pollution from old military dump sites, entrapment in abandoned shoreline structures (for example, the seawall at Tern Island), and expansion of the U.S. Navy's theater ballistic missile defense development program.

Naturally occurring factors that have impeded or may impede growth of the monk seal population include disease, male aggression toward adult females and juveniles (mobbing), and habitat degradation due to storms and high seas. Reduction in prey availability due to natural variations in oceanic productivity appears to be a major factor in

the western portion of the NWHI where seal subpopulations were formerly high but have crashed during the past decade.

IV. Regional Strategic Goal

The Southwest Region's goal is to enhance recovery of the endangered Hawaiian monk seal population through implementation of the Hawaiian Monk Seal Recovery Plan and related recovery measures.

V. Regional Objectives

The following objectives have been identified to achieve the regional strategic goal:

A. *Assessment*: Evaluate the status of the monk seal population annually through efforts of the Hawaiian Monk Seal Recovery Team and other management entities.

B. *Research*: Identify critical factors limiting population growth. Initiate efforts to assess the role of health and disease in population trends. Characterize use of pelagic habitat and the relative importance of prey species.

C. *Management and mitigation*: Initiate, assess, and evaluate various recovery actions to reduce incidental human impacts. Monitor the impact of mobbing behavior. Coordinate with other agencies. Initiate a community outreach program.

VI. Major Milestones

A. Assessment:

1. Provide annual estimates of total monk seal population size.
2. Conduct annual population assessments at each major monk seal reproductive site and re-evaluate the potential for future growth.

B. Research:

1. Complete immobilizing drug tests on captive monk seals.
2. Complete investigations on etiology of eye disease in captive seals.
3. Research, design, and implement new translocation programs to bolster population growth at selected reproductive sites.
4. Develop a plan and initiate studies to assess the role of health and disease in population trends to facilitate translocation efforts.
5. Complete a report on satellite tracking studies at Pearl and Hermes Reef.

C. Management and mitigation:

1. Identify options and recommend action for the relocation of the 10 female monk seals held in captivity at the NMFS Kewalo facility.
2. Complete the Midway recovery plan and initiate recovery efforts to enhance population growth at Midway atoll.
3. Assess implementation of the Hawaiian Monk Seal Recovery Plan and modify as required.
4. Establish memoranda of understanding and other agreements to coordinate monk seal recovery actions with other agencies (for example, the USFWS and the State of Hawaii).
5. Evaluate commercial fishing logbook information to determine the need for vessel monitoring systems and observers on vessels fishing near major monk seal reproductive locations to assess potential seal/fishery interactions.
6. Reduce incidental human impacts on the Hawaiian monk seal annually (for example, remove marine debris, protect vital marine and terrestrial habitat).
7. Monitor the impact of mobbing behavior annually and mitigate as appropriate.
8. Initiate education and community outreach programs that include information on the biology, natural history, and recovery of monk seals.

VII. Related Coastal or NMFS Programs

Because of potential monk seal-fishery interactions, the monk seal program is connected to the large pelagics fisheries (longline) and the insular fisheries (lobster, bottomfish) programs.

Program 6: Insular Fisheries

I. Background

Although the non-pelagic fisheries in the Pacific island areas consist of small fishing fleets and relatively small commercial landings of bottomfish and crustaceans, they are dynamic and generally growing in overall intensity and complexity. There is need for continued technical support by the Southwest Region, working with the WPRFMC, in the areas of biological research and stock assessment, fishery and economic monitoring, management program formulation and implementation, environmental protection, and constituent services in the U.S. insular Pacific.

In the crustacean fishery, the major commercial fishery for spiny and slipper lobsters occurs in the NWHI. Lobster fishing around the main Hawaiian Islands, American Samoa, Guam, and the Northern Mariana Islands is primarily recreational and for artisanal or subsistence purposes.

The NWHI lobster fishery began in 1977 and is managed under an FMP. Some of the key FMP regulatory measures include escape vents in traps, daily catch and effort logbooks, annual harvest guidelines, seasonal closure, gear restrictions, and a limited access program. NWHI lobster landings and CPUE peaked in the mid-1980s, then gradually declined from 1985 through 1990. During the 1997 lobster fishing season (July 1 through July 22), a total of 310,000 lobsters were landed, which represented 96% of the annual harvest guideline. Spiny lobsters comprised 60% (175,000) of the catch and slipper lobsters 40% (134,000). The dockside value of the lobsters landed was estimated at \$1.3 million.

Recent research suggests that a dynamic recruitment process for lobsters is linked to cyclical meso-scale oceanic current structure changes. This process has apparently dictated the location of the fishery in the NWHI.

The bottomfish fishery in the insular areas consists of deepwater and shallowwater multispecies complexes of snappers, groupers, jacks, and emperor fish. The deepwater (100-400 m) snappers are the most commercially important, both in landings and ex-vessel revenue (510,000 pounds in 1996, valued at \$2.1 million). Generally, bottomfish have a relatively high age at maturity, a long life span, and a slow growth rate which, combined with considerable variation in larval recruitment, make them susceptible to overfishing.

In 1996, a total of 903,000 pounds of bottomfish, generating an estimated ex-vessel revenue of \$2.5 million, were landed from the U.S. Pacific island areas. Roughly 80% of the bottomfish harvested were from the Hawaiian Islands.

The seamount fishery for pelagic armorheads within the U.S. EEZ over the summits and upper slopes of the southern Emperor-northern Hawaiian Ridge (NWHI) has been closed to fishing since 1987 in response to its overfished condition. The WPFMC extended the moratorium through 2003.

The fishery for precious corals was last active during the mid- to late-1970s, when a total of 8,524 kg of precious corals were harvested from the established bed at Makapuu, Oahu. In 1997, a local private company applied for and received a permit to fish the Makapuu bed. Harvesting commenced in early 1998 under a two-year quota of 2,000 kg for pink coral and 600 kg each for bamboo and gold corals.

The coral reef resources of the U.S. Pacific insular areas cover an estimated area of 15,851 km², of which 68% is located in the EEZ. At present there is no FMP for the non-precious coral resources. Nevertheless, the majority of the reefs under the WPFMC's purview appear to be in good condition, largely because they are located away from major human population centers. On the other hand, many of the reefs in nearshore state or territorial (non-federal) waters are degraded and overfished. The WPFMC has approved the development of a coral reef ecosystem FMP based on growing interest in coral harvesting, invertebrates, and juvenile and adult finfish within the EEZ. The FMP is expected to be submitted to the Secretary of Commerce for approval in late 1998 or early 1999.

With the exception of the overfished pelagic armorhead stock (seamount groundfish fishery), all federally managed bottomfish, crustacean, and precious coral stocks in the NWHI, American Samoa, Guam, and the Northern Mariana Islands appear to be healthy. In the main Hawaiian Islands, onaga (longtail snapper) and ehu (squirrelfish snapper) stocks that occur predominantly within state waters are overfished. Also, the hapu'upu'u (seabass) is approaching the overfished level in the main islands.

II. Major Stakeholders

Stakeholders include U.S. fishery participants (trap fishers, bottomfish handliners, deep-sea precious coral harvesters, and commercial, recreational, and subsistence fishermen) and associated support industries, as well as fish auctions, wholesale and retail markets, exporters and importers, and restaurateurs. The WPRFMC, State of Hawaii, and the governments of Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands are also important stakeholders. Additional stakeholders include several federal agencies (U.S. Coast Guard, USFWS, State Department), non-governmental organizations such as the Marine Mammal Commission, Audubon Society, Office of Hawaiian Affairs, and academia, especially the University of Hawaii and the University of Guam.

III. Major Issues

The primary issues facing the U.S. Pacific insular fisheries within the near-term (three to five years) are:

- Uncertainty about the effects of ecosystem changes on the productivity of certain stocks such as the bottomfish and crustacean stocks in the Hawaiian Islands.
- Adequacy of fishery-dependent and -independent databases and the need for better estimates of ecological and economic parameters.

- Need for improvements to stock assessment, fisheries monitoring, and management program evaluative capabilities.
- Need for timely implementation of management and conservation programs for bottomfish, crustaceans, and corals consistent with new mandates of the MSFCMA and the Sustainable Fisheries Act.
- Inconsistency between federal and island government fisheries management programs.
- Establishing ways and means for community-based fishery development programs to provide greater economic opportunities for island fishers taking into consideration the unique historical, cultural, legal, and geo-political character of the region.
- Potential for localized depletion of insular fisheries resources (for example, results from refined modeling indicate that the exploitable biomass of spiny lobster in the NWHI is less than previous estimates).
- Need for cost-effective implementation and administration of a NWHI Mau Zone bottomfish limited access program in 1999.
- Development of a new FMP for coral reefs in the western Pacific region.
- Lack of cooperative programs with the State of Hawaii to rebuild overfished onaga and ehu stocks in the main Hawaiian Islands and to prevent overfishing of other bottomfish stocks in state waters.
- Need to establish international cooperative arrangements for joint research on and management regimes for seamount groundfish and precious coral resources.
- Need for development of avoidance and mitigation practices to minimize interactions between the fisheries and protected species (for example, bottomfish handline interactions with dolphins).

IV. Regional Strategic Goals

The Southwest Region's goals are to: (1) maintain the productivity or sustainable yields of commercial, recreational, and subsistence fisheries in collaboration with the WPRFMC and U.S. Pacific island governments; (2) restore depleted or reduced fisheries; (3) minimize bycatch and waste; (4) protect against overfishing of managed bottomfish and seamount groundfish, crustacean, and coral stocks; and (5) foster precautionary (risk averse) management of insular fisheries.

V. Regional Objectives

The following objectives have been identified to achieve the regional strategic goals:

A. *Data gathering*: Substantially improve data collection programs and databases for stock assessment and for reliable determinations of long-term yield potentials.

B. *Economic performance*: Significantly improve the ability to monitor and document the economic performance of FMP-managed Pacific insular fisheries.

C. *Analyses*: Derive maximum sustainable yield estimates with greater precision, including confidence limits, for exploitation of insular fishery resources. Analyze impacts of environmental variations on the resources and ecosystem.

D. *Fishery management plans*: Implement FMPs developed by the WPRFMC for Pacific insular fishery resources (bottomfish, crustaceans, corals) efficiently to maintain the productivity of fisheries on a continuing basis and to safeguard against overfishing of the resources.

VI. Major Milestones

A. Data gathering:

1. Consider new mechanisms for cost-effective fishery monitoring and data collection, such as contracts with the private sector for observer coverage.
2. Secure adequate funding and a stable funding base for reestablishment of the RecFIN program in the Western Pacific Fishery Information Network (WPacFIN).
3. Conduct or assist in biological studies on shallowwater/deepwater bottomfish complex (for example, lethrinids) to determine size composition, CPUE of the virgin populations, size at maturity, maximum sustainable yield estimates, etc.
4. Cooperate and initiate programs with the State of Hawaii to effectively monitor and manage the main Hawaiian Islands bottomfish fishery.

B. Economic performance:

1. Collect vital economic statistics, including social and cultural data, for developing alternative and more effective or more efficient insular fisheries management and resource allocation strategies.
2. Evaluate the need for bank-specific quotas in the NWHI commercial lobster fishery.

C. Analyses:

1. Study the spatial and temporal dynamics of the oceanic habitat to gain a better understanding of the impact of environmental variables on the distribution and abundance of insular bottomfish and crustacean populations.
2. Provide NMFS input to WPRFMC annual reports on the status of stocks and fisheries under the bottomfish and corals FMPs on schedule. Information on bycatch and discards should be included in the reports.
3. Undertake joint assessment of the seamount groundfish resources in the central North Pacific with Japanese scientists as part of an international initiative to rebuild the overfished pelagic armorhead stock.
4. Assist the WPRFMC in incorporating ecosystem principles (for example, multi-species modeling, harvest refugia, oceanographic information) during the development of a coral reef ecosystem FMP for the western Pacific region.
5. Assist the WPRFMC in reassessing the status of insular bottomfish and lobster stocks consistent with the new “overfishing” definition contained in the MSFCMA.

D. Fishery management plans:

1. Provide the WPRFMC with the best scientific and resource management advice, including guidance on development of recovery plans for overfished stocks, pursuant to the obligations of the MSFCMA.
2. Develop a long-term WPacFIN programmatic and funding plan to ensure that cost-effective technical support is provided to Hawaii, American Samoa, Guam, and the Northern Mariana Islands.

VII. Related Coastal or NMFS Programs

Related programs include sustainable fisheries, habitat conservation, protected species, and intergovernmental and recreational fisheries.

Program 7: Pacific Sea Turtles

I. Background

Sea turtles are designated worldwide as threatened and endangered species. Population declines have been prominent in the Pacific islands of Polynesia, Melanesia, and Micronesia as the result of turtle nesting habitat loss and excessive and widespread harvesting for commercial and subsistence purposes. The principal species of concern to Pacific islanders are the green turtle and the hawksbill turtle. Both turtles have recently become the focus of considerable conservation efforts by the Regional Marine Turtle Conservation Programme of the South Pacific Regional Environment Programme, servicing the environmental needs of 22 Pacific island nations.

There are two loggerhead turtle populations in the Pacific, one originating in Australia, where serious declines are occurring, and the other in Japan, where the numbers of nesting females appear to be stable. Leatherback turtles inhabiting the Pacific mainly originate from nesting beaches in Mexico and Costa Rica, where significant declines have been documented; in Indonesia, where their status is uncertain but possibly stable; and in Malaysia, where the nesting colony is nearly extinct despite 30 years of conservation measures. Olive ridley turtles of the Pacific nest mainly in Mexico and Costa Rica.

II. Major Stakeholders

Major stakeholders in Pacific sea turtle research, recovery, and management are numerous and varied, including U.S. and foreign fishery participants; associated support

industries; the Inter-American Tropical Tuna Commission; non-governmental conservation organizations such as the International Union for the Conservation of Nature; the PFMFC and WPRFMC; the states of California, Oregon, Washington, and Hawaii; Guam, the Northern Mariana Islands, American Samoa, and the Pacific U.S. affiliates of Palau, Federated States of Micronesia, and Republic of the Marshall Islands; Mexico, Costa Rica, Chile, Japan, Australia, and numerous other Pacific Rim and insular Pacific island nations (as represented by the South Pacific Regional Environment Programme); and the USFWS, National Park Service, EPA, U.S. Coast Guard, Department of Defense agencies including the Army Corps of Engineers, and the NMFS Office of Protected Resources.

III. Major Issues

The Southwest Region and Center play a vital role in assisting and advising the South Pacific Regional Environment Programme in conducting its regional sea turtle program. There is presently the strong desire by inhabitants of many Pacific islands to reverse declining trends of sea turtles so as not to lose an acknowledged important part of their cultural and nutritional way of life. This task will not be easy due to inherent biological constraints of most sea turtles, which include long oceanic reproductive migrations, vulnerability to predation, unknown pelagic life stages, and slow growth resulting in delayed sexual maturity of 20 or more years.

Green turtles in the Hawaiian Islands are genetically discrete and geographically isolated. This population has responded favorably to 20 years of recovery and research efforts by the Southwest Region and Center working in cooperation with the USFWS, the State of Hawaii, and several private conservation organizations. The number of green turtles nesting in Hawaii each year has substantially increased on the index nesting site of East Island at French Frigate Shoals in the NWHI. The total number of nesting females in the population, however, is still well below historical levels, and fibropapilloma disease continues to be a threat. The number of green turtles observed in waters around the main Hawaiian Islands has also increased significantly. Turtles in these foraging pastures are mostly immature turtles resulting from the increased nesting success.

The greater numbers of green turtles in the main Hawaiian Islands have resulted in more opportunities for tourists and local people to view turtles in the water in the same manner that humpback whales are an ecotourism attraction. The successes thus far achieved in the biological recovery of the Hawaiian green turtle population constitute a model example in research and management for the rest of the Pacific islands. The olive ridley turtle nesting in the eastern Pacific in Mexico has also shown significant population increases in recent years under protective management and research by the Mexican government.

Leatherbacks, loggerheads, and olive ridleys are the species of principal concern with regard to bycatch in pelagic longline and other commercial fisheries of the Pacific conducted mainly by Japan, Taiwan, Korea, and to a lesser extent the United States. In addition, leatherbacks are sometimes incidentally taken in the coastal driftnet fishery of the western United States. The pelagic distribution of sea turtle populations is poorly understood. Additional research is therefore needed to link by-caught turtles with their nesting beach sites of origin.

IV. Regional Strategic Goals

The Southwest Region's goals are to: (1) achieve the biological recovery and sound long-term management of sea turtle populations in Hawaii and other U.S.-affiliated islands in the Pacific Ocean; and (2) assist Pacific island nations, Mexico, Costa Rica, and other appropriate Pacific Rim nations to recover sea turtle populations to the fullest extent possible.

V. Regional Objectives

The following objectives have been identified to achieve the regional strategic goals:

A. *Conservation and recovery*: Implement high-priority action set forth in the Pacific sea turtle recovery plans. Assess post-hooking survival, movements, and ecology in pelagic habitats relating to bycatch in the longline fishery. Reduce or mitigate bycatch. Foster conservation through public education and information activities.

B. *Information gathering*: Conduct biological investigations.

C. *Analyses*: Develop comprehensive computer simulation models and other quantitative tools to monitor population trends and better facilitate sea turtle recovery efforts. Assess impacts of commercial fishery bycatch. Ascertain quantitatively reliable stock structure of Pacific species stock structure using molecular genetics technology.

D. *Disease control*: Investigate the pathology, etiology, and epidemiology of fibropapilloma and take steps to control and manage the disease.

E. *Partnerships*: Collaborate with other institutions to assess, monitor, and manage populations to effect recovery and sustainability. Encourage and assist efforts by the USFWS and other appropriate state and federal agencies to conduct research, and protect and manage sea turtles and their habitats at terrestrial nesting sites. Conduct cooperative research and provide technical assistance and research training to Pacific island and

Pacific Rim nations to promote the collection, analysis, and sharing of sea turtle data, including fishery bycatch data.

VI. Major Milestones

A. Conservation and recovery:

1. Implement high-priority actions of the U.S. Pacific sea turtle recovery plans.
2. Implement recommendations of the Honolulu workshop on post-hooking mortality and take steps to prevent and mitigate longline interactions with sea turtles.
3. Raise the sea turtle interaction and bycatch issue to the Interim Scientific Committee for North Pacific Tuna and Tuna-Like Species.
4. Convene an annual meetings of Southwest Region, Southwest Fisheries Science Center, and NMFS Office of Protected Resources personnel to review goals, objectives, strategies, resources, and sea turtle implementation plans.
5. Assess post-hooking survival, movements, and ecology in pelagic habitats relating to bycatch of sea turtles in longline fisheries.

B. Information gathering:

1. Monitor, assess, and conduct biological investigations at selected sea turtle breeding sites and foraging pastures.

C. Analyses:

1. Complete genetic stock assessment of all species of sea turtles in the Pacific.

D. Disease control:

1. Implement research and management recommendations of the 1997 marine turtle fibropapilloma workshop.

E. Partnerships:

1. Convene a workshop in Mexico for Pacific sea turtle programs to review priorities, standardize data collection and tagging techniques, and implement technology transfer.
2. Establish memoranda of understanding or other mechanisms to coordinate and collaborate with other entities with responsibilities and interests in sea turtle recovery actions (USFWS, State of Hawaii, WPRFMC, U.S. Geological Survey, National Park Service, non-governmental organizations).

VII. Related Coastal or NMFS Programs

Related programs include protected resources, large pelagics, habitat conservation, and the conservation programs of the USFWS, State of Hawaii, U.S. Geological Service, U.S. National Park Service, and other governments.

Program 8: Eastern Tropical Pacific Dolphins

I. Background

The Southwest Fisheries Science Center and Southwest Regional Office have been involved for nearly 30 years in research and management of the impact of the tuna purse-seine fishery on tropical dolphin populations. Although a dozen species are reported to be killed by the fishery in the eastern tropical Pacific Ocean (ETP), more than 99% of the mortality involves three species: spotted, spinner, and short-beaked common dolphins. Each of these species is divided into several stocks for management purposes.

To assess how dolphin stocks are affected by the tuna fishery, four basic kinds of information are utilized: stock boundaries, numbers of dolphins killed, a relative index of population size, and an absolute estimate of population size. The two stocks of dolphins that are most frequently set on by fishermen, northeastern offshore spotted and eastern spinner dolphins, are estimated to have had their populations reduced by 84% and 80%, respectively. Most of these declines took place in the early years of the fishery, in the 1960s and early 1970s, when dolphin mortality was extremely high. A second period of high mortality occurred during the mid-1980s when Latin American fishermen entered the fishery in large numbers. From a high point in 1986, mortality has declined dramatically in the last decade due to a combination of factors: observers on boats, skipper performance reviews, U.S. embargoes, and “dolphin-safe” labeling. At present, annual incidental mortality is reported to be less than 0.2% of population size for all dolphin stocks. Such a

low mortality rate should have a negligible impact on population dynamics and should, if maintained, allow depleted dolphin populations to recover.

As the fishery evolved from a U.S.-dominated to an international fleet, management of the dolphin bycatch became more complicated. In 1992, the “La Jolla Agreement” set a timetable for reducing total dolphin mortality and put mortality limits on individual vessels. In 1995, the “Panama Declaration” set mortality limits by stock, provided for an end to U.S. embargoes of tuna, and proposed a new definition of dolphin-safe. The International Dolphin Conservation Program Act of 1997 implemented the provisions of the Panama Declaration domestically and mandated significant new studies of ETP dolphin populations.

II. Major Stakeholders

Stakeholders include tuna fishermen, tuna processors and canners, environmental groups, Congress, the IATTC, the Marine Mammal Commission, NMFS, the International Whaling Commission, foreign governments, and the U.S. public.

III. Major Issues

A significant new initiative began in August 1997 as a result of new amendments to the MMPA. These amendments (the International Dolphin Conservation Program Act) mandate specific research activities by NMFS to determine whether the practice of chase and encirclement by tuna vessels is having a significant adverse impact on dolphin stocks. Although mortality is currently reported to be very low, there is no clear evidence that dolphin populations are recovering. There are several possible explanations. One hypothesis is that the stress involved in chasing, encircling, and temporarily confining a school of dolphins may be having an adverse impact on dolphin stocks. If it is found that the fishery is having a significant adverse effect, the current definition of dolphin safe (that no dolphins were chased or encircled while catching the tuna) will be retained; otherwise the definition of dolphin safe will be changed to mean that no dolphins were killed in that particular set, even if dolphins were chased and encircled. The Secretary of Commerce must make a preliminary determination on this question by March 31, 1999, and a final determination by December 31, 2002.

A related issue is the claim that purse-seine fishing by setting on dolphins is the best way to catch tuna considering the whole ETP ecosystem. This is because non-dolphin bycatch is high for log and school fishing (the alternatives to dolphin fishing) and because tuna not associated with dolphins tend to be much smaller, even pre-reproductive. Congress directed that NMFS should undertake studies of (non-dolphin) bycatch and its impact.

The availability and acquisition of ships and ship time at sea are also major issues. The dolphin abundance surveys will cover huge areas of the ocean and require large blocks of ship time over the next three years. Because a preliminary decision on adverse impact must be made in 1999, an extra effort is necessary to gather as much information as possible during the 1998 survey; in particular, a third ship will be needed in addition to the NOAA ships *David Starr Jordan* and *McArthur*. Ship time used for ETP dolphin surveys will preclude additional marine mammal surveys in the U.S. EEZ for a period of three years. For surveys in future years, the *McArthur* needs to be replaced as a pelagic survey platform.

Another issue is that the status of other dolphin stocks has not been assessed. Each of the three main species has a coastal form whose population size is much smaller than the offshore stock and which, therefore, may be affected by even relatively small numbers of animals killed in the tuna fishery, as well as by largely unassessed incidental kill in national coastal net fisheries.

IV. Regional Strategic Goals

The Southwest Region's goals are to: (1) continue to reduce, with the ultimate goal of eliminating, dolphin mortality in this fishery within the framework of the MMPA and international agreements; and (2) maintain the health of the ETP ecosystem.

V. Regional Objectives

The following objectives have been identified to achieve the regional strategic goals:

A. *Population estimation*: Conduct ETP dolphin population estimates and assessments.

B. *Stress studies*: Undertake dolphin stress studies related to vessel operations.

C. *Adverse impacts*: Estimate the adverse impacts to ETP dolphins resulting from chase and encirclement operations.

D. *Non-dolphin bycatch*: Assess the impact of non-dolphin bycatch on the health of ETP ecosystem.

E. *Monitoring and compliance*: Monitor ETP dolphin mortality caused by U. S. fishermen and support compliance with tuna import regulations.

VI. Major Milestones

A. Population estimation:

1. Complete a population survey in 1998.
2. Estimate dolphin abundance by stock by February 28, 1999.
3. Complete population surveys in 1999 and 2000.
4. Estimate dolphin abundance by stock for all years by June 30, 2001.

B. Stress studies:

1. Complete a stress-related literature review by September 31, 1998.
2. Complete stress-related necropsy research by July 1, 2001.
3. Complete stress-related historical demographic and biological data analyses by July 1, 2001.
4. Complete a stress-related chase and recapture experiment by July 1, 2001.

C. Adverse impacts:

1. Define “significant adverse impact” by December 31, 1998.
2. Make a preliminary estimate of impact by February 28, 1999.
3. Make a final estimate of impact by June 30, 2001.

D. Non-dolphin bycatch:

1. Prepare a research plan and budget to carry out this objective.

E. Monitoring and compliance:

1. Monitor and report dolphin mortality by U.S. fishermen annually.
2. Write implementing regulations by May 1998.

VII. Related Coastal or NMFS Programs

Related programs include Pacific region marine mammals, Hawaiian monk seals, and large pelagics.

Program 9: Pacific Region Marine Mammals

I. Background

The Pacific region includes the U.S. EEZ waters off California and the Hawaiian Islands and has 50 stocks of marine mammals for which NMFS has management authority (including the Hawaiian monk seal which is considered separately; see Program 5). Stock assessment reports have been written for all of these species, but available information is minimal for most Hawaiian cetaceans. Three stocks in California (sperm whales, pilot whales, and humpback whales) are considered “strategic” under the MMPA because their total human-caused mortality exceeds allowable levels (termed “potential biological removal” or PBR).

Most large whales off California and Hawaii are listed as endangered and are still recovering from periods of intensive coastal and pelagic whaling that ended in the 1960s and 1970s for most species. Humpback whales in the entire Pacific basin are now believed to number 6,000-8,000 and appear to be on the road to recovery. Blue whales off the California coast number approximately 2,000 and also show signs of growth. There is no current evidence of population growth in sperm whales, and the population off California, Oregon, and Washington numbers only about 1,200. Gray whales have been protected longer than most of the other species and now, with a population of more than 20,000, have been removed from the endangered species list.

Most pinniped populations in California are still recovering from a long period of exploitation and hunting that did not end until the passage of the MMPA in 1972. Harbor seals, California sea lions, northern fur seals, and northern elephant seals appear to be increasing at California rookeries. Only Steller sea lions off California have slowly declined since the 1950s, to about 1,500 animals. Steller sea lions have declined sharply throughout their range in just the last 20 years, and the population from California to southeastern Alaska is currently classified as threatened under the ESA.

Most small cetaceans off California and Hawaii have not been subject to a long history of human exploitation. The concern for these species stems from the recent development of gillnet fisheries. Harbor porpoise in central California have been subject to the longest period of incidental mortality in coastal setnet fisheries for white seabass

(1940s–1960s) and California halibut (1970s–1990s). The current estimate for the central California stock of harbor porpoise is 3,800. The incidental kill reached levels of 200-300 per year in the early 1980s but has decreased as a result of decreased fishing effort in the late 1980s and 1990s. Drift gillnet fisheries for swordfish and sharks take a wide variety of cetacean species from further offshore in California and Oregon. Surveys since 1991 have provided population estimates for the majority of species taken in the drift gillnet fishery. Population estimates are lacking for most small cetaceans around the Hawaiian Islands.

II. Major Stakeholders

Stakeholders include environmental non-governmental organizations, fishers, fishing organizations and related industries, the U.S. Navy, the states of Hawaii and California, the International Whaling Commission, the Marine Mammal Commission, the Pacific Region Scientific Review Group, and the National Marine Sanctuaries (Channel Islands, Monterey Bay, Gulf of the Farallones, Cordell Bank, Hawaiian Islands).

III. Major Issues

Studies of marine mammal populations have focused on a few primary questions: (1) have fisheries and other human-related activities directly harmed marine mammal populations or significantly altered the carrying capacity of the marine ecosystem for them (2) are the depleted and endangered marine mammals recovering and have the best steps been taken to speed their recovery? (3) how can we best monitor and manage marine mammal populations in the face of uncertainty and environmental variability? and (4) what is the genetic structure of marine mammal populations and how does this structure relate to the optimal units for management? There is growing recognition that marine mammal management should be coordinated on an international level, as is currently being done in the International Whaling Commission.

The PBR approach was developed at the Southwest Fisheries Science Center as a tool for determining allowable levels of human-caused mortality and is now part of the MMPA. The human-caused mortality for most stocks off California is already below PBR levels. Mortality for the remaining species (pilot whales, sperm whales, and humpback whales) was required by the MMPA to be reduced to below PBR in 1997 through actions in the Pacific Offshore Cetacean Take Reduction Plan (including net pingers). Human-caused mortality in fisheries must be reduced to “insignificant levels approaching zero mortality rate” by April 2001. This goal may not be easily achieved in either the California drift or set gillnet fisheries. Estimates of mortality caused by drift gillnet fisheries will continue to be required.

Stock boundaries for many stocks remain ill defined, and this is a significant management issue. To meet management objectives, stock boundaries need to be drawn so that the ranges of species are maintained while minimizing costs to fisheries. In addition to traditional tools that are used to determine when movement is limited between areas (such as morphology, tagging, and life history), molecular genetic data are now used more to directly estimate rates of gene flow. Both laboratory and analytical techniques need to be developed to achieve the goal of being able to decide when areas should be split (managed separately) or pooled (managed as a single unit).

The continued growth of pinniped populations in California is another area of concern. In some regions, pinnipeds are now encroaching on human habitats and concerns include human health and safety. Interactions between pinnipeds and commercial and sport fishermen are increasing and fishers are becoming increasingly agitated about their loss of catch. There is also some concern about the impact of pinnipeds on locally depleted salmonid resources in California.

The major cetacean issues in Hawaii pertain to humpback whales. Insufficient information exists to evaluate the potential impact of incidental fishery mortality on insular cetaceans. The Pacific Region Scientific Review Group has repeatedly called for more research on Hawaiian cetaceans. Abundance surveys and fishery interactions studies are needed in this area.

IV. Regional Strategic Goals

The Southwest Region's goals are to: (1) reduce human-caused mortality of all marine mammal stocks to below PBR levels, and (2) reduce other negative human-marine mammal interactions.

V. Regional Objectives

The following objectives have been identified to achieve the regional strategic goals:

A. *Information gathering*: Gather sound scientific information for revising stock assessment reports and PBR levels and for down-listing or de-listing endangered species.

B. *Monitoring*: Monitor abundance for all marine mammal stocks with surveys conducted at least once every four years.

C. *Incidental take*: Reduce incidental marine mammal mortality in California drift gillnet fisheries to levels approaching zero mortality and serious injury rate by April 2001.

D. *Conservation and management*: Improve the international conservation and management of marine mammals.

VI. Major Milestones

A. Information gathering:

1. Review the status of all marine mammals in the U.S. EEZ of the Southwest Region and, if appropriate, revise status of stocks reports in September of each year.
2. Develop molecular and statistical techniques to distinguish stocks by 2001.
3. Conduct aerial and ground censuses of pinnipeds (California sea lion, harbor seal, elephant seal) in California at least once every three years for each species.
4. Continue to collect and analyze food habit data for pinnipeds along the west coast.

B. Monitoring:

1. Continue gray whale recovery monitoring surveys in 1998 and 1999 as recommended by the NMFS Gray Whale Monitoring Task Group.

C. Incidental take:

1. Provide annual estimates of the incidental mortality of marine mammals using data collected by trained fishery observers.
2. Monitor progress of the Pacific Offshore Cetacean Take Reduction Plan to reduce incidental marine mammal mortality in California drift gillnet fisheries.

D. Conservation and management:

1. Participate in international cooperative research, organizations, and agreements as appropriate.
2. Continue MMPA implementation as required by recovery plans, take reduction teams, and the Pacific Region Scientific Review Group as appropriate.

VII. Related Coastal or NMFS Programs

Related programs include Hawaiian monk seals and the USFWS's California sea otter research and recovery program.

Program 10: Antarctic Marine Living Resources Research

I. Background

The Antarctic Marine Living Resources (AMLR) Convention Act of 1984 provides the legislative authority necessary to implement the U.S. AMLR program. The program provides information to the U.S. delegation to the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) and is managed by the Antarctic Ecosystem Research Group at the Southwest Fisheries Science Center.

CCAMLR is an international treaty between 23 nations that seeks to manage Antarctic fisheries with the goal of preserving species diversity and stability of the entire Antarctic marine ecosystem. In keeping with this objective, CCAMLR has designated areas of research that member nations are obligated to pursue. The AMLR program has identified specific data sets that must be collected to respond to CCAMLR's research directives. In doing so, the AMLR program supports the U.S. commitment to CCAMLR.

Since 1986, the United States has conducted field studies in Antarctic waters to investigate the effects of krill, crab, and finfish fisheries on the ecosystem, including effects on seal and seabird populations. The studies include an annual two- or three-month research vessel survey to map krill distribution and abundance and to measure environmental variables influencing krill in a study area off the Antarctic Peninsula, research at a land station to determine effects of fishing on seal and penguin populations during their reproductive cycles, and a bottom trawl survey in the Antarctic Peninsula area to investigate direct effects of a finfish fishery.

II. Major Stakeholders

In addition to the CCAMLR members and the various academic institutions associated with CCAMLR, other stakeholders include several federal organizations, the U.S. State Department, the Marine Mammal Commission, and the National Science Foundation. U.S. domestic fisheries are also large stakeholders.

III. Major Issues

Due to the potential for new fishery opportunities, the developing longline fishery is an emerging issue, as are the various illegal fisheries that occur in Antarctic waters. Seabird mortality associated with the longline fishery and krill fishery in Antarctic waters is also a key issue.

IV. Regional Strategic Goal

The Southwest Region's goal is to provide scientific and management advice to the State Department to ensure continuation of U.S. policy relating to the conservation and management of marine living resources in Antarctic waters consistent with requirements of CCAMLR.

V. Regional Objectives

The following objectives have been identified to achieve the regional strategic goal:

- A. *Prevention*: Prevent harvested populations from falling below the level that ensures the greatest net annual increment.
- B. *Ecological relationships*: Maintain ecological relationships between harvested, dependent, and related populations of Antarctic marine living resources.
- C. *Restoration*: Restore depleted populations of Antarctic marine living resources.
- D. *Minimize risk*: Prevent or minimize the risk of changes in the Antarctic marine ecosystem that are not potentially reversible over two or three decades.

VI. Major Milestones

A. Prevention:

1. Collect and analyze commercial Antarctic crab, krill, and finfish data from U.S. fishing vessels.
2. Participate in data analyses and the formulation of scientific recommendations by the CCAMLR Scientific Committee's Working Group on Fish Stock Assessment for all finfish, krill, squid, and crab species harvested in Antarctic waters.
3. Recommend total allowable catch limits for non-depleted finfish, krill, squid, and crab species harvested in Antarctic waters to the State Department.

B. Ecological relationships:

1. Conduct annual predator/prey research in Antarctic Peninsula area.
2. Provide results of research to CCAMLR's Working Group on Ecosystem and Management by July of each year.

C. Restoration:

1. Participate annually in CCAMLR's Working Group on Fish Stock Assessment to analyze research data for all depleted fish stocks in Antarctic waters.
2. Recommend the scientific findings of CCAMLR's Working Group on Fish Stock Assessment, including species prohibitions, area and season closures, gear restrictions, size limit restrictions, and bycatch restrictions, to the State Department.

D. Minimize risk:

1. Provide scientific advice to the State Department to ensure that a conservative approach is followed in the management of Antarctic marine living resources and that management decisions error in favor of the resources and not the fishery.

VII. Related Coastal or NMFS Programs

Related programs include marine mammals and sustainable fisheries. Marine mammal research is integrated with several programs at the NMFS Northeast Fisheries Science Center, NMFS Alaska Fisheries Science Center, and the University of California at Santa Cruz. In addition, there is involvement with the International Whaling Commission and the Southern Ocean Global Ocean Ecosystem Dynamics Program.

III. Supporting Programs

In addition to participating in or administering 10 living marine resources programs, the Southwest Region conducts three key supporting programs. These three programs cut across the various resource programs and add value examining and analyzing them from ecosystem and social perspectives. The programs include habitat essential fish habitat, recreational fishing, and economics. In a similar fashion to the 10 resource programs,

these cross-cutting programs carry their own assortment of major issues and specific goals, objectives, and milestones.

Program 11: Habitat and Essential Fish Habitat

I. Background

The health and productivity of fish populations are dependent on habitat quantity and quality. The role of habitat in supporting fish productivity has been thoroughly documented in the ecological literature, and the linkage between habitat availability and fishery productivity has been clearly established for several fishery species. The goals of FMPs cannot be achieved if managed species do not have a sufficient quantity of suitable habitat.

Fish species use habitat for spawning, breeding, migration, feeding, growth, and shelter. Most habitats, however, provide only a subset of these functions. Fish habitat requirements can change with life history stage, abundance of the species, competition from other species, and environmental variability in time and space. The type of habitat available, its attributes, and its functions are important to species productivity and societal benefits.

Under a number of federal statutes (including the Fish and Wildlife Coordination Act, Clean Water Act, and National Environmental Policy Act), the Southwest Region reviews potential development projects to insure that fish habitat is not degraded and, in cases where some impacts are likely, makes strong recommendations to minimize, offset, or mitigate these impacts.

In late 1996, another tool for habitat protection was provided to the agency in the form of the Sustainable Fisheries Act, which amended the MSFCMA. The Sustainable Fisheries Act requires NMFS to carry out a number of activities to describe, identify, conserve, and enhance essential fish habitat. Essential fish habitat is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. The Sustainable Fisheries Act added several requirements to FMPs that were to be implemented by the fishery management councils: (1) describe and identify essential fish habitat for managed fisheries based on guidelines established by NMFS; (2) minimize the adverse effects on essential fish habitat caused by fishing, to the extent practicable; and (3) identify actions to encourage the conservation and enhancement of essential fish habitat. These last two provisions are to be carried out by means of an essential fish habitat consultation process developed by NMFS. Consultations are to be conducted by NMFS working in concert with the fishery management councils. These consultations

will most likely be undertaken in conjunction with the other federal statutes mentioned above as well as in “critical habitat” consultations as required under the ESA.

II. Major Stakeholders

Stakeholders include the PFMF, WPRFMC, other NMFS offices including the Offices of Sustainable Fisheries and Protected Resources and the Northwest Regional Office, and various federal agencies such as the U.S. Army Corps of Engineers, USFWS, Bureau of Reclamation, Minerals Management Service, and EPA, among others. Also involved are state and local agencies, including the California Resources Agency, especially its Department of Fish and Game, and regional water boards. Industry stakeholders include timber, agriculture, property developers, and port authorities. Non-governmental organizations and commercial and recreational fishers complete the list of major stakeholders.

III. Major Issues

The productivity of a living marine resource is a function of the environmental conditions in which the species lives as well as its biological characteristics. If the quality or amount of habitat available to support a species is degraded or lost, the overall productivity of the stock decreases and fewer are available for harvest. These concerns are particularly important as essential fish habitat continues to be impacted in the Southwest Region (for example, tidal wetlands). Efforts to restore fish habitat degraded by man-made development and activities must remain a high priority.

The amendments to the MSFCMA require NMFS to assist the fishery management councils in the identification of essential fish habitat, adverse impacts to essential fish habitat, and actions to ensure conservation and enhancement of that habitat. This requirement dictates that the Southwest Region provide assistance to both the WPRFMC and PFMF. Coordination on the review of actions that may adversely impact essential fish habitat will need to be developed between NMFS and the fishery management councils, although it is most likely that NMFS will undertake the majority of consultations as it currently does under the provisions of the ESA and the Fish and Wildlife Coordination Act.

Assembling and updating large amounts fish habitat information for each FMP will task the Southwest Region to undertake a data management effort that it is not currently prepared to do. As a result, the Southwest Region will need to embark on implementing a geographical information system for the region to not only prepare maps of essential fish habitat boundaries but also to be able to perform consultations in a timely fashion when they begin in early 1999. Because the ultimate goal of essential fish habitat is to conserve

and enhance habitat relative to fishing and non-fishing activities on a site-by-site basis, consideration of a geographical information system is appropriate and would facilitate the Southwest Region's efforts to implement the essential fish habitat initiative as required by Congress.

IV. Regional Strategic Goals

The Southwest Region's goals are to: (1) identify and restore essential fish habitats; and (2) manage for no net loss the habitats of the commercial and recreational fishes of the Southwest Region.

V. Regional Objectives

The following objectives have been identified to achieve the strategic goals:

A. *Describe and identify essential fish habitat*: Develop scientifically sound essential fish habitat recommendations as required by the MSFCMA for the respective essential fish habitat amendments submitted by the WPRFMC and the PFMC.

B. *Information gathering*: Provide updated information and recommendations based upon sound scientific evidence to the fishery management councils for improving essential fish habitat fish habitat identifications.

C. *Restore degraded habitats*: Restore 2,000 acres of Southwest Region degraded fishery habitat in cooperation with state and federal resource agencies and stakeholders.

D. *Essential fish habitat consultations*: Conduct consultations for the purpose of conserving and enhancing essential fish habitat.

VI. Major Milestones

A. Describe and identify essential fish habitat:

1. Assist the WPRFMC and PPMC in developing essential fish habitat recommendations for respective essential fish habitat amendments to FMPs.

B. Information gathering:

1. Design a database system to collate existing and future fisheries data as well as data on anthropogenic threats by 1999.
2. Use habitat database to identify information gaps by 1999.
3. Establish a new research effort to address future FMP habitat needs.
4. Identify habitat quality and evaluation techniques for key species by 2001.
5. Document the juvenile fish productivity of selected coastal habitats for commercial and recreational species by 1999.
6. Quantify the contribution of juvenile productivity to adult stocks by 2001.

C. Restore degraded habitats:

1. Justify the receipt of funding from NMFS Restoration Center in concert with other funding sources (for example, the Coastal America program) to restore fishery habitat by 2000.
2. Evaluate impacts of human activities on selected marine ecosystems.
3. Coordinate with other state and federal natural resource agencies and non-governmental organizations for restoring 2,000 degraded wetlands to productive fishery habitat by 2001.

D. Essential fish habitat consultations:

1. Develop geographical information system expertise within the Southwest Region and Center.
2. Develop and operate a region-wide database management system for identifying essential fish habitat and conducting essential fish habitat consultations.

VII. Related Coastal or NMFS Programs

Habitat conservation and enhancement supports other fishery resource programs, especially sustainable fisheries and protected resources (salmon, monk seal). Habitat

conservation is also related to NOAA's damage assessment and restoration program and the Coastal America program.

Program 12: Recreational Fisheries

I. Background

Executive Order 12962 - Recreational Fisheries directs all federal agencies to "improve the quality, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities." The 1995 order requires that each federal agency develop a five-year plan to implement the provisions of the order; provides an additional tool for creating partnerships with states, tribes, and non-government organizations; requires the NMFS and USFWS to develop a joint policy for making the ESA work better; and requires federal agencies to report annually to the Sport Fishing and Boating Council on specific accomplishments for implementing the executive order and their five-year plans.

In response, the NMFS prepared a Recreational Fishery Resources Conservation Plan (1996–2001) consisting of four implementation strategies tied to the NMFS national and regional strategic plans. These strategies are: (1) conserve, enhance, and restore recreationally important fish stocks and their habitat; (2) develop opportunities for increased recreational fishing access and facilities in the marine environment; (3) promote public education and support for marine resource conservation and angling ethics; and (4) work cooperatively with state and tribal governments, industry, user and conservation groups, and other potential partners to advance marine resource conservation, enhance recreational fishing opportunities, and establish cost-share programs.

At the headquarters level, NMFS created the Office for Intergovernmental and Recreational Fisheries to track and report NMFS accomplishments, to support regional activities that promote the NMFS Recreational Fishery Resources Conservation Plan, and, as resources permit, to implement additional activities to support the plan. A west coast coordinator position for recreational fisheries was created and located in the Southwest Region's Long Beach office.

II. Major Stakeholders

Participants in the recreational fishery, including anglers, tackle manufacturers, bait fishing industry, fishing tournament operators, and the commercial passenger fishing vessel industry, form a large portion of stakeholders. Others include the natural resources agencies in California and Hawaii and other federal and state resource agencies that

regulate or administer programs that affect the fishery. The WPRFMC and PFMC are also key stakeholders, as are commercial fishermen.

III. Major Issues

A major issue is equitable fishery allocations between sport, commercial, and tribal entities, particularly regarding salmon, groundfish (including lingcod and key rockfish species), and sharks. Another issue is reduced sportfish quotas related to ESA issues and a perception that other entities (hydropower, agriculture, forestry, commercial fisheries, urban areas) are not shouldering their proportional share to protect sport fishery resources.

Some issues relate to specific recreational fisheries; for example, there is concern that NMFS is too restrictive on programs related to striped bass enhancement in San Francisco Bay. Similarly, anglers want increased NMFS support for mass marking of hatchery fish.

NMFS will increasingly assume a leadership role in a number of areas affecting recreational fisheries, such as the management of coastal pelagic species. Recreational fishermen are concerned about commercial overfishing of coastal pelagics, specifically squid, anchovy, and sardine stocks, and reducing bycatch that directly or indirectly impacts sport fishing. The angling community will continue to look to NMFS for assistance in gaining representation on the fishery management councils.

Another issue is habitat protection and restoration, particularly as it relates to enhancing sport fishing. One particular concern is that impediments to salmon and steelhead trout migration are not being eliminated or appropriately mitigated in a timely manner (for example, mitigation for Rindge Dam, a non-functional impediment for some 20 years, has yet to occur). Anglers are also interested in programs to convert decommissioned offshore oil and gas platforms into artificial reefs. At the same time, however, there is skepticism about proposals for harvest refugia, and anglers will increasingly look to NMFS for scientific rationale to justify or refute such proposals.

The issue of fishery data collection continues to emerge in conversations with sport fishermen, including concern that the quality and quantity of data needed to evaluate the status and trends of stocks are inadequate and thereby lead to decisions that favor commercial interests.

Anglers are also concerned that both state and federal enforcement of sport and commercial fisheries regulations is inadequate to properly protect fisheries resources. With regard to regulations, there is increasing concern that NMFS is unable to develop

and publish fishery regulations in a timely manner, thus putting fishery resources at risk of overexploitation.

IV. Regional Strategic Goals

The Southwest Region's goals are to: (1) facilitate implementation of the NMFS Recreational Fishery Resources Conservation Plan and its associated reporting requirements; and (2) identify regional opportunities for adding value to existing or proposed projects that incorporate recreational fishing interests and concerns.

V. Regional Objectives

The following objectives have been identified to achieve the regional strategic goals:

A. *Documentation*: Track existing Southwest Region and Center programs to document benefits and opportunities to recreational fishermen.

B. *Information gathering*: Continue data collection efforts regarding catch and economics of recreational fisheries to facilitate appropriately balanced management decisions.

C. *Outreach*: Seek opportunities to provide recreational fishermen with information on NMFS management for sustainable fisheries and to encourage fishermen to interact with NMFS.

VI. Major Milestones

A. *Documentation*:

1. Continue the Southwest Fisheries Science Center's billfish tagging and reporting program, including the production and distribution of the annual Billfish Newsletter.
2. Continue to investigate devices for non-lethal deterrence of seals and sea lions from sport fishing boats.
3. Investigate opportunities for increasing fish production via artificial reef research, with a particular focus on decommissioned offshore oil and gas platforms.

B. *Information gathering*:

1. Cooperate with the AFTCO tag/flag program to include sailfish, bluefin tuna, and striped marlin from the Baja California area in the 1998 tagging program.
2. Continue to investigate salmon hooking mortality issues and identify techniques to minimize such mortality.
3. Continue participation in the NMFS Marine Recreational Fishery Statistics Survey (MRFSS) and RecFIN to track fishing effort, especially on rockfish species.
4. Coordinate selected economic and demographic research efforts to augment the basic MRFSS.
5. Continue efforts to collect essential fish habitat information to assist in the conservation and enhancement of habitat important to both recreationally and commercially caught species.

C. Outreach:

1. Seek and implement opportunities to assess (in cooperation with Mexico) the economics, biology, and management of yellowtail, white seabass, barracuda, and bonito.
2. Develop an anglers' guide of recreational fish of the Pacific coast.
3. Cooperate with the California Department of Fish and Game's youth fishing club program.
4. Develop a Web site to provide sport fishing information and links to other sites of interest to recreational anglers.
5. Coordinate with the Southwest Region's public affairs officer to ensure that recreational fishing issues are addressed in the regional outreach plan.

VII. Related Coastal or NMFS Programs

Related programs and offices include the NMFS Office of Intergovernmental and Recreational Fisheries, the Saltonstall-Kennedy Grant program, and the California Sea Grant program.

Program 13: Economics

I. Background

The five Southwest Region and Center economists are distributed among four different locations. The Southwest Region's only economist is with the Sustainable Fisheries Division in Long Beach, California. In the Southwest Fisheries Science Center,

one economist is attached to the Santa Cruz/Tiburon Laboratory and is stationed at Santa Cruz, California, one is with the Fishery Management and Performance Investigation at the Honolulu Laboratory in Hawaii, and two are with the La Jolla Laboratory's Coastal Fisheries Resources Division in La Jolla, California.

A \$140,000 socio-economic research fund established with the passage of the Magnuson Fishery Conservation and Management Act in the 1970s was lost to budget cuts several years ago.¹ As a result, economic research is conducted as an adjunct to other programs or through grants. The Southwest Region's economists emphasize collaboration with economists at various universities in conducting their research.

Economic research emphases in the Southwest Region are:

- West coast groundfish.
- Salmon.
- Coastal pelagics.
- Recreational fisheries (west coast and Hawaii).
- Western Pacific FMPs (pelagics, lobster, and bottomfish).
- Protected marine species.

Research involves both applied economic analysis and data collection in relationship to specific fisheries and protected species management problems, as well as broader theoretical research on fisheries management and related subjects (for example, habitat restoration). The research is oriented towards the following topics:

- Cost-benefit analysis of management and ESA listing options.
- Bio-economic and other interdisciplinary systems analysis.
- Analysis of management in the presence of risk and uncertainty.
- Industry and recreational response to management measures.
- Habitat restoration analysis.
- Recreational and other non-market valuation.
- Limited access and alternative fishery management systems.

Legislation and executive orders are central to the economic research and analysis tasks. These include the MSFCMA, MMPA, and ESA, which represent the primary

¹ The Southwest Region/Center economics research program was summarized in Pooley, S. G., S. F. Herrick, D. E. Squires, C. J. Thomson, and G. W. Silverthorne. 1991. Southwest Fisheries Science Center and Southwest Region economics research plan, 1990-95. Southwest Fisheries Center Admin. Rep., Honolulu, H-91-07. 12 p.

authorizing legislation driving Southwest Region economics research, as well as executive orders concerning regulatory impact assessments, etc.

II. Major Stakeholders

The fishery management councils are the major clients of economic research in this region, primarily through the councils' plan teams. In addition, other offices of NMFS and NOAA are clients, primarily in terms of habitat and related issues. The fishing community, both commercial and recreational, also is a major stakeholder.

III. Major Issues

Seven areas of potentially emerging issues in the Southwest Region are:

- Essential fish habitat.
- Core statistics program.
- North Pacific highly migratory species international management (contribution to U.S. efforts towards regional fishery management).
- Community development programs in Hawaii (newly authorized under the MSFCMA).
- Disaster relief in Pacific coast salmon, squid, herring, and groundfish fisheries.
- Critical habitat designation for California chinook salmon, coho salmon, and steelhead trout.
- Use of harvest refugia in fishery management.

IV. Regional Strategic Goal

The Southwest Region's goal is to provide a broad spectrum of high-quality applied economic research and analysis to improve decision making for living marine resource management issues.

V. Regional Objectives

The following objectives have been identified to achieve the regional strategic goal:

A. *Data acquisition*: Improve acquisition of and access to economic data needed to perform economic analyses to support new agency initiatives in accordance with the MSFCMA. Support regulatory actions resulting from recent and anticipated ESA listings of Southwest Region species.

B. *Economic analyses*: Perform economic analyses supporting optimal management actions under the MSFCMA, ESA, and MMPA.

C. *Coordination*: Coordinate Southwest Region and Center economic research and data collection activities with NMFS economists nationally.

VI. Major Milestones

A. Data acquisition:

1. Convene a workshop to evaluate existing procedures for estimating salmonid habitat restoration costs and devise ways of improving these procedures by 1999.
2. Complete a proposal for implementing the MRFSS in Hawaii, to incorporate WPacFIN recreational survey systems in American Samoa, Guam, and the Northern Mariana Islands into the MRFSS and to include appropriate economic characteristics in the survey by December 1999.
3. Initiate research on economic game-theory applications to highly migratory species management in the central Pacific by December 1998.
4. Complete a revised Southwest Region and Center economics research plan and proposal to restore the \$140,000 socio-economic research fund by December 1999.

B. Economic analyses:

1. Complete a study of capacity reduction in the Pacific groundfish fishery by December 2000, including completion of papers on defining fleet capacity and capacity utilization; significance of capacity utilization measures for a west coast groundfish capacity reduction proposal (permit buyback); survey of literature on effects of buyback programs on fleet capacity and capacity utilization; empirical application of capacity and capacity utilization measures to the west coast groundfish fleet; and a determination of revenue

per vessel, cost per vessel, and capacity reduction per dollar spent for alternative methods of financing a buyback program.

2. Complete a paper on an economic review of the groundfish fishery for the period 1981-1997 by December 1999.
3. Complete an economic analysis for amendment to the Pacific groundfish FMP to incorporate new definitions of overfishing and optimum yield as mandated by the MSFCMA by December 1999.
4. Complete economic impact analyses and Regulatory Flexibility Act analyses as required for designation of critical habitat for species listed as threatened or endangered under the ESA.
5. Complete a paper analyzing potential economic and social effects of marine harvest refugia by 1999.
6. Complete economic impact analyses of WPRFMC amendments as required.

C. Coordination:

1. Assist protected resources staff to evaluate the impact of pinniped populations on commercial and recreational salmon fishery values as required.
2. Submit a proposal for extending the collaborative University of Hawaii economic research program, including re-evaluation of Hawaii longline fishery cost-earnings and operational dynamics, by December 1998.
3. Submit a paper on community management of Hawaii fisheries by June 1999.

VII. Related Coastal or NMFS Programs

Related programs include sustainable fisheries, habitat conservation (essential fish habitat), protected resources, the NMFS Recreational Fishery Resources Conservation Plan, and core statistics.

IV. Acronyms and Abbreviations

| | |
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| AMLR | Antarctic marine living resources |
| CalCOFI | California Cooperative Oceanic Fisheries Investigation |
| CCAMLR | Convention for the Conservation of Antarctic Marine Living Resources |
| CPUE | Catch per unit effort |
| EEZ | Exclusive economic zone |
| EPA | Environmental Protection Agency |
| ESA | Endangered Species Act |
| ETP | Eastern tropical Pacific Ocean |
| FMP | Fishery management plan |
| IATTC | Inter-American Tropical Tuna Commission |
| ITQ | Individual transferable quota |
| MRFSS | Marine Recreational Fishery Statistics Survey |
| MSFCMA | Magnuson-Stevens Fishery Conservation and Management Act |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| NPFMC | North Pacific Fishery Management Council |
| NWHI | Northwestern Hawaiian Islands |
| PFMC | Pacific Fishery Management Council |
| PBR | Potential biological removal |
| RecFIN | Recreational Fishery Information Network |
| USFWS | U.S. Fish and Wildlife Service |
| WPacFIN | Western Pacific Fishery Information Network |
| WPRFMC | Western Pacific Regional Fishery Management Council |